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ABSTRACT

A study used encapsulation and integration strategies to determine the effect of different learning strategies on transfer of learning. The instrument consisted of three forms with four parts each. Each form assessed a different learning strategy: encapsulation, integration, and the participant's own learning strategy. The functions for each of the four parts were knowledge acquisition prestrategy, practice learning strategy, knowledge acquisition post-strategy, and transfer of learning. Participants were 113 students from 8 intact graduate classes in the College of Education at a major southwestern university. Their ages ranged from 22-66 years. Two analyses of covariance (ANCOVA) were used to test the difference in the group effects from the three learning strategies as affected by gender: one for the concept acquisition task and another for the learning transfer task. ANCOVA test results for knowledge acquisition showed a significant two-way interaction between the strategies and genders in the knowledge acquisition; ANCOVA test results for transfer of learning showed no significant interaction. Although the transfer of learning results showed no significant interaction, the pattern of the results seemed to support Iaccino's (1993) suggestion that females were hindered by encapsulation strategy (their nonpreferred strategy), while males were hindered by integration strategy (their nonpreferred strategy). (Appendixes contain 16 references and the instrument.) (YLB)

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Running head: DO DIFFERENT LEARNING STRATEGIES AFFECT WOMEN AND MEN

Do Different Learning Strategies Affect Women and Men Differently in Their Learning?

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Abstract

This article discusses findings of gender differences in knowledge acquisition and transfer of learning that were not reported in the earlier article (Wang & Taraban 1997). In the previous article, it is reported that learning strategies do affect adults' transfer of learning. The results for the study also indicate there are gender differences in applying learning strategies to knowledge acquisition but not transfer of learning.

The definition of transfer of learning is application of prior knowledge in new situations (Cormier & Hagman, 1987; Ormrod, 1995; Singley & Anderson, 1989). To determine the effect of different learning strategies on transfer of learning, encapsulation and integration strategies were used in the study. The encapsulation strategy, when acquiring knowledge, is encoding the knowledge in specific form, such as a visual representation. This bonding of new knowledge to a specific object or context may prevent future retrieval of the knowledge in a different context (Sternberg & Frensch,1993). The integration strategy, on the other hand, requires individuals to understand new knowledge in relationship to their prior knowledge by forming a big picture, by relating to specific information and by placing it in different possible contexts (Ford, 1994; Fox, 1994; Ottoson, 1994). The integration process is, in fact, the definition of transfer of learning. It follows that integration strategy would enhance transfer of learning. Encapsulation, on the other hand, prevents future accessibility of prior knowledge; therefore, it would likely hinder transfer of learning.

The comparison of two learning strategies seems to be quite straightforward. However, the gender studies literature suggests that males and females have different preferences for

processing information that would affect their abilities to apply the learning strategies. Males who tend to prefer analytical processing (discrete, objective, and abstract) would most likely use encapsulation as their usual learning strategy. Females, on the other hand, who preferred global processing (simultaneous, subjective and concrete), would more likely use integration as their usual learning strategy (Iaccino, 1993; Springer & Deutsch, 1993). Thus, the use of an integration strategy would favor females in both their knowledge acquisition and transfer task over males, because females preferred the strategy. The use of an encapsulation strategy would only favor males in knowledge acquisition, but not in transfer of learning, because it does not enhance transfer of learning. A control group of males and females (using a strategy of their own choice) provided a baseline comparison measure.

Methods

Instrumentation

The instrument consisted of three forms (A, B, and C) with four parts each (see Appendix). Each form assessed a different learning strategy (A: encapsulation; B: integration; C: the participant's own learning strategy). The following figure depicts the overview of the functions for each of the four parts.

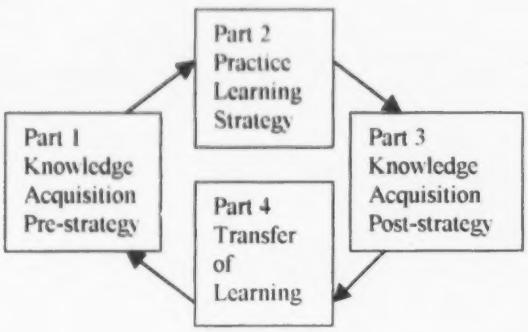

Fig. 1 Overview of the Instrument Procedure

Parts 1 and 3 consisted of knowledge acquisition tasks with multiple-choice assessments. The reading comprehension for Part 1 contained general information on transfer of learning while Part 3 contained specific examples of transfer strategies. Each multiple-choice assessment contained six items with four response options. Part 2 consisted of different version for each Form A, B or C. Participants who received Form A practiced encapsulation while form B recipients practiced integration, and Form C recipients practiced their own strategies (see Appendix). Part 4 contained the task for transfer of learning where participants were instructed to generate an application of the learning strategy from Part 3. Both parts 2 and 4 consisted of open-ended responses.

Participants

The participants were 113 students from eight, intact graduate classes in the College of Education at a major southwestern university. Their ages ranged from 22 to 66 years with an average age of 34 years. Fifty-two percent (n=63) of the participants were females and 43 percent (n=48) were males. Their professions represented 28 major fields.

Procedure

Each testing session took about 30 minutes in a regular classroom period. Participants randomly received one of the three test forms. They were instructed to complete the test in sequential order from Part 1 to Part 4 (see Wang, 1996 and Wang & Taraban, 1997).

Results

- Scoring the responses. The participant's result for each test item was given a rating of 4 for an excellent response to a rating of 1 for a poor response that reflected the

varying levels of knowledge acquisition, learning strategy, or transfer of learning. Each point value was pre-assigned by the consensus of four independent raters (Wang, 1996).

- Statistical analyses. The results from parts 1 and 3 provided the measures for knowledge acquisition and parts 2 and 4 provided the measures for transfer of learning.

Two analyses of covariance (ANCOVA) were used to test the difference in the group effects from the three learning strategies as affected by gender: one for the concept acquisition task and another for the learning transfer task. The test results of ANCOVA for knowledge acquisition showed that there was a significant 2-way interaction between the strategies and genders in the knowledge acquisition ($F(2,103) = 6.30$, $p < .05$). However, the test results of ANCOVA for transfer of learning showed no significant interaction ($F(2,78) = 1.42$, $p > .05$) . Figures 1 depicts the gender comparisons for the knowledge acquisition.

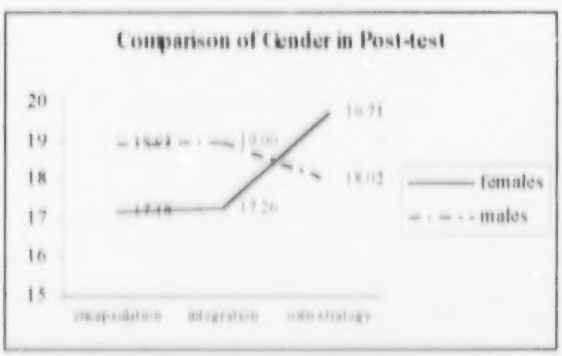

Figure 1. The Acquisition of Concepts

Figure 1 shows that females who practiced with either of the assigned learning strategies

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(encapsulation, M = 17.18, and integration, M = 17.26) performed less well than the females who practiced with their own strategies (the baseline data, M = 19.71). For males, the effects learning strategies had somewhat the reverse pattern of females. Males who practiced with either of the assigned learning strategies (encapsulation, M = 18.93 and integration, M = 19.00) did slightly better in their post-test performances than males who practiced with their own strategies (the baseline data, M =18.02).

Figure 2 shows the gender comparisons for the transfer of learning

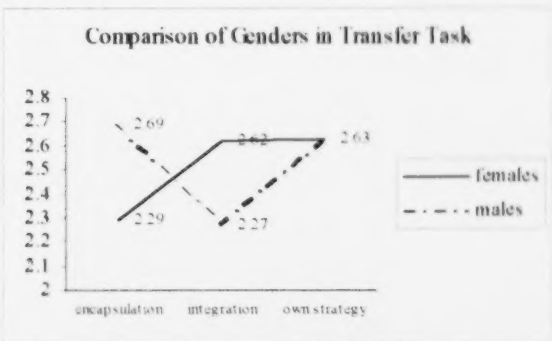

Figure 2. Transfer of Learning

Although the difference is not significant, Figure 2 shows that females who practiced with encapsulation -- their non-preferred strategy (M = 2.29) -- did slightly worse than the other females who practiced with either integration strategy (M = 2.62) or their own strategy (M = 2.63). The result for males was that they did slightly worse when they practiced with integration strategy -- their non-preferred strategy (M = 2.27) -- than with the other two conditions (encapsulation, M=2.69 and own, M = 2.63).

Discussion

The finding from ANCOVA measuring knowledge acquisition indicated that males

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benefited from assigned learning strategies practices other than their own strategy practices. As for females, the assigned learning strategies practices decreased their knowledge acquisition compared to their own strategies. This result does not support Iaccino's (1993) report that females' own strategies would be more similar to integration strategy while males' own strategies would be more similar to encapsulation strategy. Although the transfer of learning results showed no significant interaction, the pattern of the results seemed to support Iaccino's suggestion that females were hindered by encapsulation strategy (their non-preferred strategy) while males were hindered by integration strategy (their non-preferred strategy). For future studies, it would be interesting to examine how different learning strategies affect females and males differently in their knowledge acquisition as compared to transfer of learning.

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Appendix

The following questionnaire contains the original context but not in the original format.

QUESTIONNAIRE

Part I Reading Forms A, B, and C

Please first read the following section before reading and answering the multiple-choice items that follow.

Applying Classroom Learning to Work (Part 1)

In recent years, the number of continuing education courses for adult professionals has increased to meet our need to remain professionally competent in a rapidly changing society. We can no longer rely completely on our daily experiences to remain current in our professional skills and knowledge. As the number of courses increases, we become concerned with the value of the courses. We want to know if the courses are really teaching us what we need to know in our respective fields. Are we using what we learned on our job?

In 1988, a review article on the effect of American training in the work place reports that American companies spent about $100 billion annually to train their workers and no more than 10% of the training was actually used on the job. This means that businesses waste $90 billion annually in training workers. The questions are, why is this happening and how can we fix it?

The findings on applying classroom learning to real world situations are diverse and at times contradict one another. They do not give clear and definite answers. Our problem is not that there is a lack of a solution, but that there are too many. How can we find the right solutions among so many contradictions? To resolve this issue, I have adopted a familiar strategy of looking at the repeated pattern of agreements among the studies.

I found some ideas that many seasoned professionals could have told us. For us to apply knowledge and skills to a task, we must first learn the knowledge and skills. Acquiring concepts, however, does not automatically ensure that we will use them. Studies suggest that it is important for us not only to learn the appropriate knowledge and skills but also to learn them in ways that encourage future use. A promising method for acquiring new concepts for application is to learn the abstract principles and visualizing concrete examples of the concepts in multiple contexts. These same three elements of learning are incorporated in several professional training programs (i.e., those for doctors, nurses, and teachers).

Evaluation for **Part I**.

Please read the following items **only when you are ready to answer them**. When answering the items, do not refer back to the reading. **Please do not write on this form.** Just circle the best answer and place any comments you have about the question on the answer sheet.

1. Americans spend about $100 billion annually to train workers and no more than 10% of the training is actually used on the job. The purpose of this statement is to show that
   A. American business is committed to training their workers.
   B. failure to apply training to work settings is wasting American financial resources.
   C. workers can apply only 10 % of what they learned.
   D. it is crucial to understand how individuals learn so they can apply what they have learned.

2. To select the right solutions among many, I adopt a familiar strategy of looking at the repeated pattern of agreements . . . . The strategy is to look for the
   A. identical results from similar studies.
   B. findings from researchers with the same philosophical approaches.
   C. common practices among professionals.
   D. overlapping commonalities of the findings among diverse studies.

3. Knowing a concept, however, does not automatically ensure that we will use it. The idea behind this is that
   A. we need more than just knowing the concept.
   B. knowing a concept does not help us to apply it to a new situation.
   C. some of us believe that if we know a concept, we will use it.
   D. we need to practice in addition to knowing the concept.

4. A promising learning method for application is to use
   A. integration, elaboration, and visualization.
   B. a combination of teaching concepts and skills.
   C. rote memorization and repeated problem solving practice skill.
   D. abstract principles, concrete examples, and multiple contexts.

5. The problem is not that there is a lack of solutions, but that there are too many . . . . This means that
   A. our problem is one of selection, rather than one of discovering new solutions.
   B. we need to find a criterion for selecting the appropriate solution.
   C. our problem is not as hopeless as we originally thought.
   D. it is a significant issue, because so many researchers are interested in it.

6. We can no longer rely completely on our daily experiences to remain current in our professional skills and knowledge. This statement provides the reason for
   A. incompetence in our professional work force.
   B. rapid changes in technology and information in our society.
   C. the increase in number of courses in continuing education.
   D. why professionals should attend classes.

For the following three forms, each participant only received one of the three forms.

Part II Visualization Learning Strategy Practice Exercise **FORM A**

For this part of the questionnaire, you are to practice using the **visualization learning strategy** to help you to remember the concepts from the readings. This is done by creating a visual image of the concepts. The image only needs to be helpful for your future recall and does not necessarily need to be meaningful to other people.

Example: If you were to apply the visualization strategy to the sentence, " Knowing a concept does not automatically ensure that we will use it." you might see yourself sitting in the driver's seat for the first time, not knowing what to do even though you have had hours of lecture on driving.

Following are two key sentences from the readings in Part I. Each sentence has four visualization responses given by the pilot-study participants. There is no best response. First select a response for each sentence that makes most sense to you. Then use visualization learning strategy to modify your selected responses. You may refer back to the readings in Part I. Circle your choices and record the improved response on the answer sheet. Please **do not write on this form.**

A. We can no longer rely completely on our daily experiences to keep current in our professions.

1. "As an adult sitting in an office, which has become totally automated, one might find oneself at a loss when trying to handle some transaction on an unfamiliar computer."
2. "I see myself in my 7th grade English classroom spinning around trying to find new materials or ideas - almost like a scavenger hunt - not much chance of being successful in such a limited setting."
3. "I see myself not meeting the real-life expectations and needs of my students - I see myself joining a work force group to practice what my students will be doing - I see myself attending conferences to give me a broader base of information and experiential vehicles to use in class."
4. "For example - letters' forms change everyday - take a letter writing course and learn new techniques."

B. To resolve this issue, I have adopted a familiar strategy of looking at the repeated pattern of agreements among the studies.

1. "I see a pattern of possible solutions - they are on separate pages - I compare like characteristics - I draw a conclusion."
2. "I picture all the teachers in my building who conduct classes in the same manner and responses the same so that their repetitions in what works for them agrees with me."
3. "I see myself observing other teachers who are using similar strategies to see whether or not these strategies are working in their classrooms."
4. "If you find yourself dealing with another employee discussing the same issue over and over eventually you come to some resolution."

Part II Integration Learning Strategy Practice Exercise **FORM B**

For this part of the questionnaire, you are to practice using **integration learning strategy** to acquire the concepts from the readings. This is done first by restating concepts to be learned into an abstraction, then by providing concrete evidence in different situations from your own experience to support the abstraction.

Example: If you were to restate, "Knowing a concept does not automatically ensure that we will use it." you might state that "in order to use a concept, we need more than just simply knowing the concept itself." To elaborate on this abstract concept, you might give a concrete example, such as, learning to drive a car. Just knowing the facts about driving is not enough. When we first learn to drive, we need to have the actual experiences of driving under different weather conditions, on different roads, and with different cars.

Following are two key sentences from the reading in Part I. Each sentence has four integration responses given by the pilot-study participants. There is no best response. First select a response for each sentence that makes the most sense to you. Then use integration learning strategy to modify your selected responses. You may refer back to the readings in Part I. Circle your choices and record the improved response on the answer sheet. Please **do not write on this form.**

A. We can no longer rely completely on our daily experiences to keep current in our professions.

1. "Most all professions that require knowledge are changing every day. We are a competitive country and are training new, younger, and cheaper labor all the time."
2. "To keep updated in our field, it is imperative to continually be educated on new findings, current research, innovative techniques, etc."
3. "As members of the 'information age', we are immersed in information that is growing exponentially on a daily bases. To stay abreast of this 'new' and rapid information, we must become adept at sifting though and applying information that is crucial to us and our employment."
4. "The knowledgebase is increasing so rapidly that workers must gather information and skills outside the work environment. At the Texas Department of Public Safety today, they had a computer, which accepted my photo, my signature, and my thumb prints. That technology would not have been introduced unless someone got the idea from outside sources."

B. To resolve this issue, I have adopted a familiar strategy of looking at the repeated pattern of agreement among the studies.

1. "In order to choose the most effective solution from a number of potential solutions, I rely on the method of seeking out the solution which was most often agreed upon by others as effective. Examples - (a) following a map or directions and (b) selecting what play to use in a sporting event."
2. "By looking at repeated agreed upon patterns, I may select better solutions. Examples - (a) history is a good predictor of future events and (b) previous experiences may predict future outcomes."
3. "Abstract principle - looking at repeated patterns of agreement allows you to select the right solution. Concrete example - bringing an umbrella will keep you dry when it rains."
4. "In order to select the right solution, one must adopt a familiar strategy of looking at the repeated pattern of agreements."

Part II Learning Strategy Practice Exercise **FORM C**

For this part of the questionnaire, you are to reread the text in Part I with the intention of applying the concepts from the readings.

Following are two key sentences from the reading in Part I. Each sentence has four responses given by the pilot-study participants using their preferred learning methods. There is no best response. First select a response for each sentence that makes the most sense to you. Then use your preferred learning method to modify your selected responses. You may refer back to the readings in Part I. Circle your choices and record the modified responses on the answer sheet. Please **do not write on this form.**

A. We can no longer rely completely on our daily experiences to keep current in our professions.

1. "Like in the nursing field through my experiences, I've had to attend several continuing education programs (usually provided by the hospital) to keep up with the changes in medical and nursing practices."
2. "Our society is changing so much and so fast that we must resort to retraining ourselves with the changing times. If not, society will leave us behind."
3. "Professions are becoming increasingly complex as the body of knowledge and level of understanding expands."
4. "We cannot rely completely on our experiences. We have to grow and change with the times."

B. To resolve this issue, I have adopted a familiar strategy of looking at the repeated pattern of agreements among the studies.

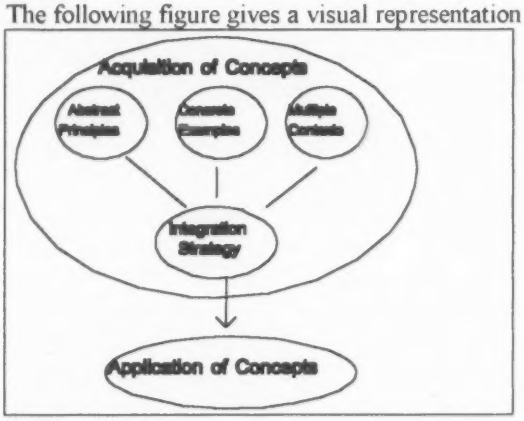
1. "Repeated patterns means that a person has mastered a certain way of doing things. We need to look at these closely and adopt the ways that have been proven."
2. "Look for commonly encountered situations where a particular situation may apply best to the application of a solution."
3. "There are a number of solutions and many problem-solving techniques, but what are some common characteristics of these techniques?"
4. "To resolve this issue you must adopt a familiar strategy of looking at the repeated pattern of agreement among the studies."

Part III Reading (Part 2)
Please first read the following section before reading and answering the five-item multiple choice questionnaire that follows. While reading this section, please **use the learning strategy you have just practiced** in Part II.

Applying Classroom Learning to Work (Part 2)

Studies show that to apply knowledge and skills to real situations it is important to understand abstract principles. A good example is a study of teaching beginners to identify the sex of day-old chicks. The task is so difficult that it usually takes years to learn in an apprentice setting. When the researchers used the abstract principles in their study, they found that their participants reached, in only 20 minutes, a level that usually takes years of practice. Other studies show that it is important to teach specific and concrete examples to achieve future use of the concepts. Case studies in professional fields involve frequent use of concrete examples. The last component is learning in multiple contexts, which can be best illustrated by internships in professional training. The literature suggests that not only are these methods, when used individually, helpful in promoting learning for application, but they are helpful when used in combination.

The following figure gives a visual representation of the three elements in the learning method.



The visual representation gives the abstraction for the learning method that depicts the relationship of the elements and the effect on transfer of learning. The assumption is that transfer of learning will more likely occur if all the three elements are integrated during the acquisition of the concepts. The concrete examples for supporting the concepts are case studies and war stories that professionals often used to illustrate abstract concepts in their training. Apprenticeship is a good example of learning in context. The training method that integrates all three elements is the student teaching practicum. A typical teaching practicum has classroom lectures on teaching theories with discussions where student teachers can share their experiences from their classroom teachings or observations. Their actual experiences in the classrooms are learning in multiple contexts. Therefore, to really learn concepts so that one will actually apply them to real world situations involves integrating all the three elements in ways that they all support one another.

The intent of this study is not to offer new methods of learning but to reexamine the well-known and practiced methods that are mentioned above. Your participation as an educator and/or as a learner is part of the reexamination process.

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Reading evaluation for Part III

Please read the following items only when you are ready to answer them. When answering the items, do not refer back to the reading. **Please do not write on this form.** Just circle the best answer and place any comments you have about the question on the answer sheet.

1. According to the reading, what types of learning elements are incorporated in many professional training methods?
   A. integration, elaboration, and visualization.
   B. abstraction, concrete illustration, and different situations.
   C. a combination of teaching abstract concepts and specific skills.
   D. repetition of facts and practice of problem-solving.

2. An example of teaching concrete experiences in the readings is
   A. practicum in student teaching.
   B. case study in the professional fields.
   C. video interaction training in driving.
   D. lab for science classes.

3. The purpose for your participation is to help me in
   A. finding ways to increase the applications of learning from classroom.
   B. exploring public opinions on the topic of transfer.
   C. confirming the need for continuing education courses.
   D. reevaluating some existing learning strategies that promotes transfer.

4. Internship is an example of teaching
   A. abstract instructions to nurses.
   B. concrete experiences to medical students.
   C. in an actual professional environment.
   D. integration of abstract and concrete examples.

5. The research study that teaches beginners to identify the sex of day-old chicks gives a good illustration of teaching
   A. abstract principles.
   B. concrete examples.
   C. in multiple contexts.
   D. a combination of A and B.

6. The underlying assumption for the visual representation in the reading is
   A. The types of concepts to be learned determine which of the three elements to use.
   B. Combining two elements in learning is better than using each separately.
   C. Integrating all elements in learning facilitates the use of the learned concepts.
   D. These three elements are important for learning any concepts.

Part IV. Application Activity

For this application activity you are to apply the concepts and learning strategy presented in Parts I to III. First you are to select a critical skill from a profession such as nursing, teaching, accounting, etc with which you are familiar. Then develop the concepts and activities that will help you to teach the critical skill to adults who are re-entering the workforce in the profession of your choice.

On the answer sheet write the skill and the profession you have selected and describe the concepts and activities that are necessary for teaching the skill in the following areas:

- List and give concrete examples of the key elements for the critical skill of your selected profession.
- Describe the learning strategy that will facilitate the learning of the critical skill.
- Suggest an evaluation method for determining in adults their success in applying the critical skill.

Please do not write on this form. Record your responses on the answer sheet.

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